

HDU Pressurized Excursion Module (PEM) Prototype Systems Integration

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ABSTRACT

The Habitat Demonstration Unit (HDU) project team constructed an analog prototype lunar surface laboratory called the Pressurized Excursion Module (PEM). The prototype unit subsystems were integrated in a short amount of time, utilizing a skunk-works approach that brought together over 20 habitation-related technologies from a variety of NASA centers. This paper describes the system integration strategies and lessons learned, that allowed the PEM to be brought from paper design to working field prototype using a multi-center team.

The system integration process included establishment of design standards, negotiation of interfaces between subsystems, and scheduling fit checks and installation activities. A major tool used in integration was a coordinated effort to accurately model all the subsystems using CAD, so that conflicts were identified before physical components came together.

Some of the major conclusions showed that up-front modularity that emerged as an artifact of construction, such as the eight 45 degree "pie slices" making up the module whose steel rib edges defined structural mounting and loading points, dictated much of the configurational interfaces between the major subsystems and workstations. Therefore, one of the lessons learned included the need to use modularity as a tool for organization in advance, and to work harder to prevent non-critical aspects of the platform from dictating the modularity that may eventually inform the flight system.

Key words: Habitat Demonstration Unit, analog, design standard, interfaces, modularity

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